UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 17 1990

OFFICE OF
WATER

MEMORANDUM

SUBJECT: Determination of "Hazardous Levels" for "No Migration" Demonstrations Pursuant to 40 CFR Section 148.20; Underground Injection Control Guidance No. 71.

FROM: Michael B. Cook, Director
Office of Drinking Water (WH-550)

TO: Water Management Division Directors
Water Supply Branch Chiefs
UIC Section Chiefs
EPA Regions I-X

BACKGROUND

Petitioners for exemptions from EPA's prohibitions on underground injection of hazardous waste must demonstrate that waste constituents will not migrate from the injection zone at "hazardous levels." See 40 CFR §148.20(a). The preamble to EPA's framework regulation described the general procedures for establishing "hazardous levels" for each waste constituent. See 53 Fed. Reg. 28,119, 28,122-23 (July 26, 1988). The purpose of this guidance is to further outline the procedure for establishing "hazardous levels" in the petition process.

"Hazardous Levels" Based on "Health-based Levels"

The first step toward establishment of a "hazardous level" for a particular hazardous waste constituent is to determine whether an EPA "health-based level" applies to the constituent. The sources of "health-based levels" are Safe Drinking Water Act Maximum Contaminant Levels, ambient water quality criteria development pursuant to Clean Water Act §304(a), and health-based limits based on verified reference doses developed by EPA's Risk Assessment Forum and site-specific Agency-approved public health advisories issued by ATSDR. See 52 Fed. Reg. 32,446, 32,453-54 (August 27, 1987). This office has developed a comprehensive listing of these "health-based levels," entitled "Concentration Limits Applicable to 'No Migration' Petitions for Injection of Hazardous Wastes", which is contained along with additional explanatory materials accompanying this guidance. This listing should be used as a starting point. The listing, however, is not binding on EPA and the Agency must assess and respond to comments concerning which level is appropriate.

"Hazardous Levels" Based on Information From Petitioner or Public Comment

When the listing does not contain a "health-based level" for a particular hazardous constituent, the petitioner may, but need not, submit toxicology studies that will allow EPA to designate a case-specific level for the constituent. The case-specific level will serve as the "hazardous level" in the "no migration" demonstration. The petitioner may propose a case-specific level for a hazardous constituent, based on the petitioner's analysis of the toxicology data. EPA will review and analyze the data to determine whether the data are sufficient to establish a case-specific level. The procedure that should be used to establish a case-specific level based on the petitioner's toxicology data is presented in "RFI Guidance, Interim Final, Section 8- Health and Environmental Assessment," May 1989. A decision on a case-specific level need only reflect that constituents at that level are not hazardous. Such a decision is fully consistent with a later finding that a higher constituent level is also not hazardous. All case-specific levels should be reviewed by Headquarters.

If establishing a case-specific level would delay petition processing and the petitioner does not desire such delay to occur, the surrogate value described below should serve as the "hazardous level" in the "no migration" demonstration.

Surrogate "Hazardous Levels" at the Detection Limit or Practical Quantitation Limit

If a particular hazardous constituent does not have a "health-based level" and a "level of concern" cannot be established due to time constraints or inadequacy of the toxicology data, then a surrogate "hazardous level" may be adopted for the constituent at the lower of (i) the lowest analytical detection limit for that constituent listed in the Third Edition of SW-846 or (ii) the lowest practical quantitation limit given for the constituent in 40 CFR Part 264, Appendix IX. Petitioners are not required to estimate ad hoc detection limits if these published sources do not provide such data, although petitioners do have the option of using such estimates to support their "no migration" demonstration.

Attachment

Concentration Limits Applicable to "No Migration" Petitions for Injected Hazardous Wastes

No Migration Petition Technical Document

U.S. Environmental Protection Agency
Office of Drinking Water
October 1990

EXECUTIVE SUMMARY

The Resource Conservation and Recovery Act (RCRA) as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) imposes significant restrictions on land disposal of hazardous waste. The statute specifically defines land disposal to include, among other things, placement in injection wells. Persons who manage hazardous waste by injection in underground wells must meet the applicable treatment standards promulgated in Part 268 Subpart D. Continued injection of untreated hazardous waste is allowed after the effective date of the regulations if EPA has granted an exemption under Part 148 Subpart C (i.e., a "no migration" exemption), or a case-by-case extension of the effective date. To be granted a "no migration" exemption, the petitioner must demonstrate through modeling that there is no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. The petitioner may use either of two approaches to make this demonstration. First, flow and transport modeling can be used to show that injected fluids will not migrate vertically out of the injection zone for 10,000 years or laterally within the injection zone to a point of discharge or interface with an underground source of drinking water. Second, geochemical modeling can be used to show that the waste is transformed so that it will become non hazardous at the edge of the injection zone.

A successful "no migration" demonstration using the approaches described above, requires the petitioner to determine the concentration at which hazardous constituents present in the waste are no longer considered hazardous to human health and the

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1 INTRODUCTION

1.1 Background

A comprehensive framework of laws and regulations has been developed to protect human health and the environment. Among the most important components of this framework are the programs that govern the management of hazardous wastes. Several laws give EPA the authority to regulate different aspects of waste management. The Resource Conservation and Recovery Act of 1976 (RCRA), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), provides the basis for regulating both solid and hazardous waste. Underground injection of hazardous waste is regulated by RCRA and the Underground Injection Control (UIC) program under the Safe Drinking Water Act (SDWA) of 1974, as amended.

One of the primary goals of HSWA is to restrict land disposal of untreated hazardous waste according to a strict schedule specified by Congress. Land disposal includes both surface (such as landfills and impoundments) and subsurface (such as underground injection) disposal. The Agency has already promulgated several land disposal restrictions rulemakings which address disposal of hazardous waste in injection wells.

Some of the major provisions of the land disposal restrictions are summarized below:

date for a specified waste, the waste may no longer be land disposed unless it meets the treatment standard, or EPA has granted an exemption or variance from the restriction.

1.1.3 Exemptions and Variances

There are three primary classes of exemptions or variances from the land disposal restrictions.

The Agency may grant a one year extension of the effective date on a case-by-case basis if a petitioner can demonstrate that treatment, recovery or disposal capacity is not currently available and the petitioner has entered into a binding agreement to create or provide alternative capacity. The extension may be renewed once for a total of two years beyond the effective date. Another variance, the treatability variance, may be granted if a petitioner can demonstrate that the waste stream is significantly different from the waste EPA evaluated when it set the treatment standard and that the promulgated treatment standard cannot be met. In such cases, the Agency will establish an alternative treatment standard applicable to the petitioner's waste and all similar waste.

The third exemption, a "no migration" exemption, may be granted to a disposal facility if the petitioner can demonstrate that the waste will not migrate beyond the disposal unit or injection zone for as long as the wastes remain hazardous.

This technical guidance covers one aspect of the "no migration" exemption for injected wastes: the concentration limit

methods require health-based concentration limits.

2.2 Concentration Limits

In order to demonstrate that the waste is non hazardous, the petitioner must show that "[b]efore the injected fluids migrate out of the injection zone or to a point of discharge or interface with a USDW, the fluid will no longer be hazardous because of attenuation, transformation, or immobilization of hazardous constituents within the injection zone..." [40 CFR 148.20 (a)(1)(ii)]

EPA has interpreted this requirement to mean that the fluid, rather than the individual constituents, leaving the injection zor is not hazardous. This interpretation means that injected flu leaving the injection zone does not contain Appendix VIII constituents at hazardous levels (40 CFR, Part 261, Appendix VIII). Therefore, in order to demonstrate that the waste is no longer hazardous, the petitioner must be able to show that concentrations of the waste are not harmful to human health or the environment. The preamble to the final rule states that "[t]he emphasis on concentration levels, as opposed to single molecules, is deeply established in EPA's regulations. Ordinarily the term "hazardous constituents" has no regulatory effect unless concentrations are also considered." [53 FR 28122]

The preamble notes that concentration limits to be used in these demonstrations will be health-based limits (HBLs) which have undergone peer review by the Agency. Where no such HBLs exist,

and advisories in EPA regulatory programs. Although MCLs reflect technological and economic factors, EPA has determined that MCLs are protective of human health [52 FR 25700-25701].

3.2 Reference Doses (RfDs)

Reference doses (RfDs) are concentration limits of specific toxic contaminants (as opposed to carcinogenic) that are "likely to be without appreciable risk of serious deleterious effects during a lifetime" of daily exposure. Unlike the RSDs described below, RfDs assume that there is some (finite) exposure to the constituent which can be tolerated without causing a toxic effect.

The calculation of an RfD takes into account the reliability of health effects data available on the toxicant by using uncertainty factors, and is protective of sensitive populations. The calculation also makes certain assumptions about exposure scenarios.

RfDs are non-enforceable limits. Many of the RfDs have been verified by the EPA RfD Workgroup, and are considered to be reliable health-based limits after MCLs for non-carcinogens. RfDs are revised when new and better data become available.

3.3 Risk Specific Doses (RSDs)

To derive risk specific doses (RSDs) for a carcinogen, EPA estimates carcinogenic potency (yielding a "dose-response" curve), linking human lifetime exposure to the constituent with excess

3.5 Ambient Water Quality Criteria

National Ambient Water Quality Criteria (AWQC) apply to surface water and, therefore, are inappropriate for groundwater programs. AWQC are non-enforceable guidelines which many States have used in establishing enforceable standards. They are health-based limits analogous to MCLGs. Their derivation assumes human exposure via two routes --ingestion of water and fish, and consumption of fish only.

4 DETERMINATION OF APPROPRIATE CONCENTRATION LIMITS

Figure 1 illustrates the decision process for determining the applicable HBL to use in a "no migration" demonstration. The appropriate concentration limits are listed in Appendix C, Table A of this document. These numbers are subject to change, therefore, petitioners are encouraged to access the "Integrated Risk Information System (IRIS)" to obtain up-to-date information on health-based levels.

Step 1: Determine whether there is a proposed or final MCL for the waste. If so, the MCL (or proposed MCL) is the limit that should be used. MCLs and proposed MCLs for Appendix VIII constituents are listed in Appendix C, Table B.

Rationale: The Agency has promulgated MCLs and Ambient Water Quality Criteria (AWQC). As discussed earlier, the AWQC are based on consumption of fish alone or consumption of fish and surface water. There are no AWQC for consumption of water alone.

Therefore, the AWQC do not apply to exposure scenarios with ground water considerations such as migration of hazardous constituents from an injection well to an aquifer. However, the Superfund Public Health Evaluation Manual," (U.S. EPA, October 1986) suggests that calculations can be made to derive an adjusted water quality criterion for drinking water ingestion only. For purposes of this guidance this approach has been rejected because additional calculations necessary to modify the criterion are not defendable given the availability of a uniformly derived drinking water standard (i.e., an MCL). The Agency believes, therefore, that a less stringent standard contradicts the strict "no migration" standard set by Congress.

Step 2: If a proposed or final MCL has not been promulgated, determine whether there is an RfD or RSD for the waste. If so, the adult oral RfD or RSD should be used. If there is both an RfD and an RSD (e.g., acetonitrile and chloroform), the lower limit should be used.
RfDs and RSDs for Appendix VIII constituents are listed in Appendix C, Table C and D, respectively.

Rationale: The adult exposure assumptions for drinking water assume water intake of 2 liters/day for a 70 kg adult over a 70-year lifetime. These assumptions take into account exposure from drinking water over a long time period. They represent standard EPA assumptions for a reasonable, worst-case scenario. For Group A and Group B carcinogens, the risk level should be 10^{-6}; for Group C carcinogens, 10^{-5}.

for determining the detection limit is described in EPA Publication No. SW-846 (Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Third Edition).

When considering the concentration limit of a particular constituent at the injection zone boundary, EPA may consider additive effects of additional constituents. Guidelines for evaluating additive affects of multiple contaminants are available in the Guidelines for the Health Risk Assessment of Chemical Mixtures, (51 FR 34014, September 24, 1986).

Rationale: EPA has used detection limits where HBLs are unavailable in its clean closure, corrective action, and delisting programs.

5 CONSISTENCY WITH OTHER EPA GUIDANCE

The approach described in Section 4 is generally consistent with the following existing EPA guidance documents: RCRA Facility Investigations (RFI) Guidance, (U.S. EPA, Draft Final, March, 1988), and the Surface Impoundment Clean Closure Guidance, (U.S. EPA, Draft Final, October, 1987). [The Agency is in the process of revising the surface impoundment guidance document to achieve greater consistency with other waste management programs.] The Agency has also coordinated development of this guidance document with relevant EPA regulations and guidance currently under development (e.g., "no migration" petition guidance for disposal units other than injection wells, De minimis program, and the Toxicity Characteristic program).

Group A (human carcinogens) include substances for which epidemiologic evidence is sufficient to show a causal connection between exposure to the constituent and cancer.

Group B are probable human carcinogens. Group B1 carcinogens include those for which there is limited epidemiologic evidence, but animal evidence is sufficient. Group B2 carcinogens have sufficient animal evidence, but epidemiologic evidence is inadequate or lacking.

Group C (possible human carcinogens) lack human data and show limited evidence of carcinogenicity in animals. Group D (not classifiable) carcinogens include those for which evidence of human and animal carcinogenicity is inadequate or lacking.

Group E (non-carcinogens) includes substances for which adequate epidemiologic and animal studies, or at least two animal studies, show no evidence of carcinogenicity.

B. MCLs

The first step of determining an MCL is to derive the maximum contaminant level goal (MCLG, formerly known as recommended maximum contaminant levels, or RMCLs). MCLGs are strictly health-based. They are set at a level where no adverse health effect is known to occur and include a margin of safety to protect especially sensitive populations.

RfDs are derived using the highest test dose associated with a no-observed-effect or no-observed-adverse-effect-level (NOAEL). Reliability of the data used is reflected in uncertainty factors. For example, when results of human exposure of appropriate durations are used to determine the NOAEL, an uncertainty factor of 10 is used. If human data are unavailable, and the data used are based on extrapolation from long-term animal studies, the uncertainty factor is 100. The uncertainty factor would be 1000 if human data and long-term animal data were unavailable, and the data used for the NOAEL were extrapolated from less than chronic animal exposure. If no NOAEL is available and a lowest-observed-adverse-effect-level (LOAEL) must be used, an additional modifying factor of 1-10 is used.

1. $\text{RfD} = \dfrac{(\text{NOAEL or LOAEL})}{(\text{UF} \times \text{MF})}$

2. $\text{Oral Adult RfD} = \dfrac{(\text{RfD}) \times (\text{BW})}{(\text{I})}$

[Note: the systemic toxicant criteria for ground water cited in RFI guidance are the same as the Oral Adult RfD]

While EPA prefers to use verified RfDs, unverified RfDs can be used as the best surrogate HBL until the verification procedure is complete.

D. Oral Risk Specific Dose (RSD)

APPENDIX B: 40 CFR 148.20

Subpart C -- Petition Standards and Procedures

§ 148.20 Petitions to allow injection of a waste prohibited under Subpart B.

(a) Any person seeking an exemption from a prohibition under Subpart B of this part for the injection of a restricted hazardous waste into an injection well or wells shall submit a petition to the Director demonstrating that, to a reasonable degree of certainty, there will be no migration of hazardous constituents from the injection zone for as long as the waste remains hazardous. This demonstration requires a showing that:

(1) The hydrogeological and geochemical conditions at the sites and the physiochemical nature of the waste stream(s) are such that reliable predictions can be made that:

(i) Fluid movement conditions are such that the injected fluids will not migrate within 10,000 years:

(A) Vertically upward out of the injection zone; or

(B) Laterally within the injection zone to a point of discharge or interface with an Underground Source of Drinking Water (USDW) as defined in 40 CFR Part I 146; or

(ii) Before the injected fluids migrate out of the injection zone or to a point of discharge or interface with USDW, the fluid will no longer be hazardous because of attenuation, transformation, or immobilization of hazardous constituents within the injection zone by hydrolysis, chemical interactions or other means; and

(2) For each well the petition has:

(i) Demonstrated that the injection well's area of review complies with the substantive requirements of § 146.63;

(ii) Located, identified, and ascertained the condition of all wells within the injection well's area of review (as specified in § 146.63) that penetrate the injection zone or the confining

to include an additional restricted waste or wastes or to modify any conditions placed on the exemption by the Director. The Director shall reissue the petition if the petitioner complies with the requirement of paragraphs (a), (b), and (c) of this section.

(f) Any person who has been granted an exemption pursuant to this section may submit a petition to modify an exemption to include an additional (hazardous) waste or wastes. The Director may grant the modification if he determines, to a reasonable degree of certainty, that the additional waste or wastes will behave hydraulically and chemically in a manner similar to previously included wastes and that it will not interfere with the containment capability of the injection zone.

Table A

Applicable Health-Based Limits For "No Migration" Petition

Constituent	Health-Based Limits[1] (mg/kg)
Acetonitrile	2E - 1**
Acetophenone	4E + 0**
2-Acetylaminofluorene	
Acetyl chloride	
1-Acetyl-2-thiourea	
Acrolein	
Acrylamide	9E - 6***
Acrylonitrile	7E - 5***
Aflatoxins	
Aldicarb	1E - 2*
Aldrin	2E - 6***
Allyl alcohol	2E - 1**
Aluminum phosphid-	1E - 2**
4-Aminobiphenyl	
5-(aminomethyl)-3-isoxazolol	
4-Aminopyridine	
Amitrole	
Ammonium vanadate	
Aniline	1E - 2***
Antimony	1E - 2**
Antimony compounds, N.O.S.[2]	1E - 2 **
Aramite	
Arsenic	5E - 2*
Arsenic compounds, N.O.S.[2]	5E - 2*
Arsenic acid	
Arsenic pentoxide	
Arsenic trioxide	
Auramine	
Azaserine	
Barium	1E + 0*
Barium compounds, N.O.S.[2]	1E + 0*
Barium cyanide	2E + 0**
Benz[c]acridine	
Benz[a]anthracene	1E - 5***

Chloroform	6E - 3***
Chloromethyl methyl ether	4E - 6***
beta-Chloronaphthalene	
o-Chlorophenol	
1-(o-Chlorophenyl)thiourea	
Chloroprene	
3-Chloropropionitrile	
Chromium	1E - 2*
Chromium compounds, N.O.S.[2]	1E - 2*
Chromium III	4E + 1**
Chromium (hexavalent)	5E - 2*
Chrysene	
Citrus red No. 2	
Coal tar creosote	
Copper cyanide	2E - 0**
Creosote	
Cresol (Cresylic acid)	2E + 0**
Crotonaldehyde	4E - 1**
Cyanides (soluble salts and complexes), N.O.S.[2]	7E - 1**
Cyanogen	1E + 0**
Cyanogen bromide	
Cyanogen chloride	
Cycasin	
2-Cyclohexyl-4,6-dinitrophenol	
Cyclophosphamide	
2,4-D	
2,4-D, salts & esters	
Daunomycin	
DDD	1E - 4***
DDE	1E - 4***
DDT	1E - 4***
Diallate	
Dibenz[a,h]acridine	
Dibenz[a,j]acridine	
Dibenz[a,h]anthracene	7E - 7***
7H-Dibenzo[c,g]carbazole	
Dibenzo[a,e]pyrene	
Dibenzo[a,h]pyrene	
Dibenzo[a,i]pyrene	
1,2-Dibromo-3-chloropropane	2E - 4*
Dibutyl phthalate	
1,2-dichlorobenzene (o-Dichlorobenzene)	6E -

Dimethyl phthalate	
Dimethyl sulfate	
Dinitrobenzene, N.O.S.[2]	
4,6-Dinitro-o-cresol	
4,6-Dinitro-o-cresol salts	
2,4-Dinitrophenol	
2,4-Dinitrotoluene	7E - 2**
2,6-Dinitrotoluene	1E - 4***
Dinoseb	4E - 2**
Di-n-octyl phthalate	
Diphenylamine	1E + 0**
1,2-Diphenylhydrazine	4E - 5***
Di-n-propylnitrosamine	
Disulfoton	1E - 3**
Dithiobiuret	
Endosulfan	2E - 3**
Endothall	7E - 1**
Endrin	2E - 4*
Endrin metabolites	
Epichlorohydrin	4E - 3***
Epinephrine	
Ethyl carbamate (urethane)	
Ethyl cyanide	
Ethylenebisdithiocarbamic acid	
Ethylenebisdithiocarbamic acid, salts & esters	
Ethylene dibromide	5E - 5 *
Ethylene dichloride	
Ethylene glycol monoethyl ether	
Ethyleneimine	
Ethylene oxide	1E - 4***
Ethylenethiourea	
Ethylidene dichloride	
Ethyl methacrylate	
Ethyl methanesulfonate	
Famphur	
Fluoranthene	
Fluorine	4E + 0*
Fluoroacetamide	
Fluoroacetic acid, sodium salt	
Formaldehyde	

Maleic anhydride	
Maleic hydrazide	2E + 1**
Malononitrile	
Melphalan	
Mercury	2E - 3*
Mercury compounds, N.O.S.[2]	2E - 3*
Mercury fulminate	
Methacrylonitrile	4E - 3**
Methapyrilene	
Methomyl	1E + 0**
Methoxychlor	1E - 1*
Methyl bromide (bromomethane)	1E - 2**
Methyl chloride (dichloromethane)	5E - 3***
Methyl chlorocarbonate	
Methyl chloroform (1,1,1-trichloroethane)	2E - 1*
3-Methylcholanthrene	4E - 6***
4,4'-Methylenebis(2-chloroaniline)	2E - 4***
Methylene bromide	
Methylene chloride	
Methyl ethyl ketone (MEK)	2E + 0**
Methyl ethyl ketone peroxide	
Methyl hydrazine	
Methyl iodide	
Methyl isocyanate	
2-Methyllactonitrile	
Methyl methacrylate	
Methyl methanesulfonate	
Methyl parathion	1E - 2**
Methylthiouracil	
Mitomycin C	
MNNG	
Mustard gas	
Naphthalene	
1,4-Naphthoquinone	
alpha-Naphthylamine	
beta-Naphthylamine	
alpha-Naphthylthiourea	
Nickel	7E - 1**
Nickel compounds, N.O.S.[2]	7E - 1**
Nickel carbonyl	
Nickel cyanide	
Nicotine	

Phenylenediamine acetate	3E - 3**
Phenylthiourea	
Phosgene	
Phosphine	1E - 2**
Phorate	
Phthalic acid esters, N.O.S.[2]	
Phthalic anhydride	
2-Picoline	
Polychlorinated biphenyls, N.O.S.[2]	5E - 4*
Potassium cyanide	2E + 0**
Potassium silver cyanide	7E + 0**
Pronamide (kerb)	3E + 0**
1,3-Propane sultone	
n-Propylamine	
Propargyl alcohol	
Propylene dichloride	
1,2-Propylenimine	
Propylthiouracil	
Pyridine	4E - 2**
Reserpine	3E - 6***
Resorcinol	
Saccharin	
Saccharin salts	
Safrole	
Selenium	1E - 2*
Selenium compounds, N.O.S.[2]	1E - 2 *
Selenium dioxide	
Selenium sulfide	
Selenourea	2E - 1**
Silver	5E - 2*
Silver compounds, N.O.S.[2]	5E - 2 *
Silver cyanide	4E + 0**
Silvex (2,4,5-TP)	3E - 1**
Sodium cyanide	1E + 0**
Streptozotocin	
Strontium sulfide	
Strychnine	1E - 2**
Strychnine salts	1E - 2**
TCDD	

2,4,6-Trichlorophenol	2E - 3***
2,4,5-T	1E - 2*
Trichloropropane, N.O.S.[2]	
1,2,3-Trichloropropane	4E - 2**
O,O,O-Triethyl phosphorothioate	
1,3,5-Trinitrobenzene	
Tris(1-aziridinyl)phosphine sulfide	
Tris(2,3-dibromopropyl) phosphate	
Trypan blue	
Uracil mustard	
Vanadium pentoxide	7E - 1**
Vinyl chloride	2E - 3*
Warfarin	1E - 2**
Warfarin salts, when present at concentrations less than 0.3%	
Warfarin salts, when present at concentrations greater than 0.3%	
Xylene	10E + 0*
Zinc cyanide	2E + 0**
Zinc phosphide	1E - 2**

[1] These criteria are subject to change. Petitioners should consult "Integrated Risk Information System (IRIS)."

[2] The abbreviation N.O.S. (not otherwise specified) signifies those members of the general class not specifically listed by name in this appendix.

*MCL or proposed MCL (Maximum Contaminant Levels)
**RfD (Reference Dose)
***RSD (Risk Specific Dose)

Toluene	2.0*
1, 1, 1-Trichloroethane	0.2
Trichloroethylene	0.005
2, 4, 5-Trichlorophenoxy acetic acid	0.01
Vinyl chloride	0.002
Xylene	10.0*

* proposed MCL

Dichloromethane (Methylene chloride)	2E + 0
2, 4-Dichlorophenol	1E - 1
1, 3-Dichloropropene	1E - 2
Dieldrin	2E - 3
Diethylphthalate	3E + 1
Dimethoate	7E - 1
2, 4-Dinitrophenol	7E - 2
Dinoseb	4E - 2
Diphenylamine	1E + 0
Disulfoton	1E - 3
Endosulfan	2E - 3
Endothal	7E - 1
Endrin	See MCL
Ethylbenzene	4E + 0
Heptachlor	2E - 2
Heptachlor epoxide	4E - 4
Hexachlorobutadiene	7E - 2
Hexachlorocyclopentadiene	2E - 1
Hexachloroethane	4E - 2
Hydrogen cyanide	7E - 1
Hydrogen sulfide	1E - 1
Isobutyl alcohol	1E + 1
Isophorone	7E + 0
Lindane (hexachlorocyclohexane)	See MCL
Maleic hydrazide	2E + 1
Methacrylonitrile	4E - 3
Methomyl	1E + 0
Methyl ethyl ketone	2E + 0
Methyl isobutyl ketone	2E + 0
Methyl parathion	1E - 2
Nickel	7E - 1
Nitric oxide	4E + 0
Nitrobenzene	2E - 2
Nitrogen dioxide	4E + 1
Octamethylpyrophosphoramide	7E - 2
Parathion	1E - 2
Pentachlorobenzene	3E - 2
Pentachloronitrobenzene	1E - 1
Pentachlorophenol	1E + 0
Perchloroethylene (Tetrachloroethylene)	4E - 1
Phenol	1E + 0
Phenylmercuric acetate	3E - 3
Phosphine	1E - 2
Potassium cyanide	2E + 0

Table D

Health-Based Criteria for Carcinogens

Constitutent	Class (A, B, C)	RSD (mg/kg/day)
Acrylamide	B	9E - 6
Acrylonitrile	B	7E - 5
Aldrin	B	2E - 6
Aniline	C	1E - 2
Arsenic	A	See MCL
Benz(a)anthracene	B	1E - 5
Benzene	A	See MCL
Benzidine	A	2E - 7
Benzo(a)pyrene	B	3E - 6
Beryllium	B	7E - 6
Bis(2-chloroethyl) ether	B	3E - 5
Bis(chloromethyl) ether	A	4E - 6
Bis(2-ethylhexyl) phthalate	B	4E - 3
Cadmium	B	See MCL
Carbon tetrachloride	B	See MCL
Chlordane	B	3E - 5
1-Chloro-2, 3 epoxypropane (Epichlorohydrin)	B	4E - 3
Chloroform	B	6E - 3
Chloromethyl methyl ether	A	4E - 6
Chromium (hexavalent)	A	See MCL
DDD	B	1E - 4
DDE	B	1E - 4
DDT	B	1E - 4
Dibenz(a,h) anthracene	B	7E - 7
1, 2-Dibromo-3-chloropropane	B	2E - 6
1, 2-Dibromoethane	B	--
Dibutylnitrosamine	B	6E - 6
1, 2-Dichloroethane	B	See MCL
1, 1-Dichloroethylene	C	See MCL
Dichloromethane (Methylene chloride)	B	5E - 3
1, 3-Dichloropropene	B	2E - 4
Dieldrin	B	2E - 6
Diethylnitrosamine	B	2E - 7
Diethylstilbestrol (DES)	A	7E - 8

APPENDIX D: REFERENCES

Water Quality Criteria Documents. November 28, 1980 (45 FR 79318-79380).

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